PROOF OF FORMULA 3.791.1

$$\int_0^{\pi/2} \frac{x\,dx}{1+\sin x} = \ln 2$$

Let $t = \pi/2 - x$ to produce

$$\begin{aligned} \int_0^{\pi/2} \frac{x\,dx}{1+\sin x} &= \int_0^{\pi/2} \frac{(\pi/2-t)\,dt}{1+\cos t} \\ &= 2\int_0^{\pi/4} \frac{\pi/4-s}{\cos^2 s}\,ds. \end{aligned}$$

Integrate by parts to obtain

$$\int_0^{\pi/2} \frac{x\,dx}{1+\sin x} = 2\int_0^{\pi/4} \tan s\,ds,$$

where $t = 2s$. This gives the result.